

No. 733,872.

PATENTED JULY 14, 1903.

G. S. RAMSAY.
COKE OVEN.

APPLICATION FILED MAY 31, 1902.

NO MODEL.

3 SHEETS—SHEET 1.

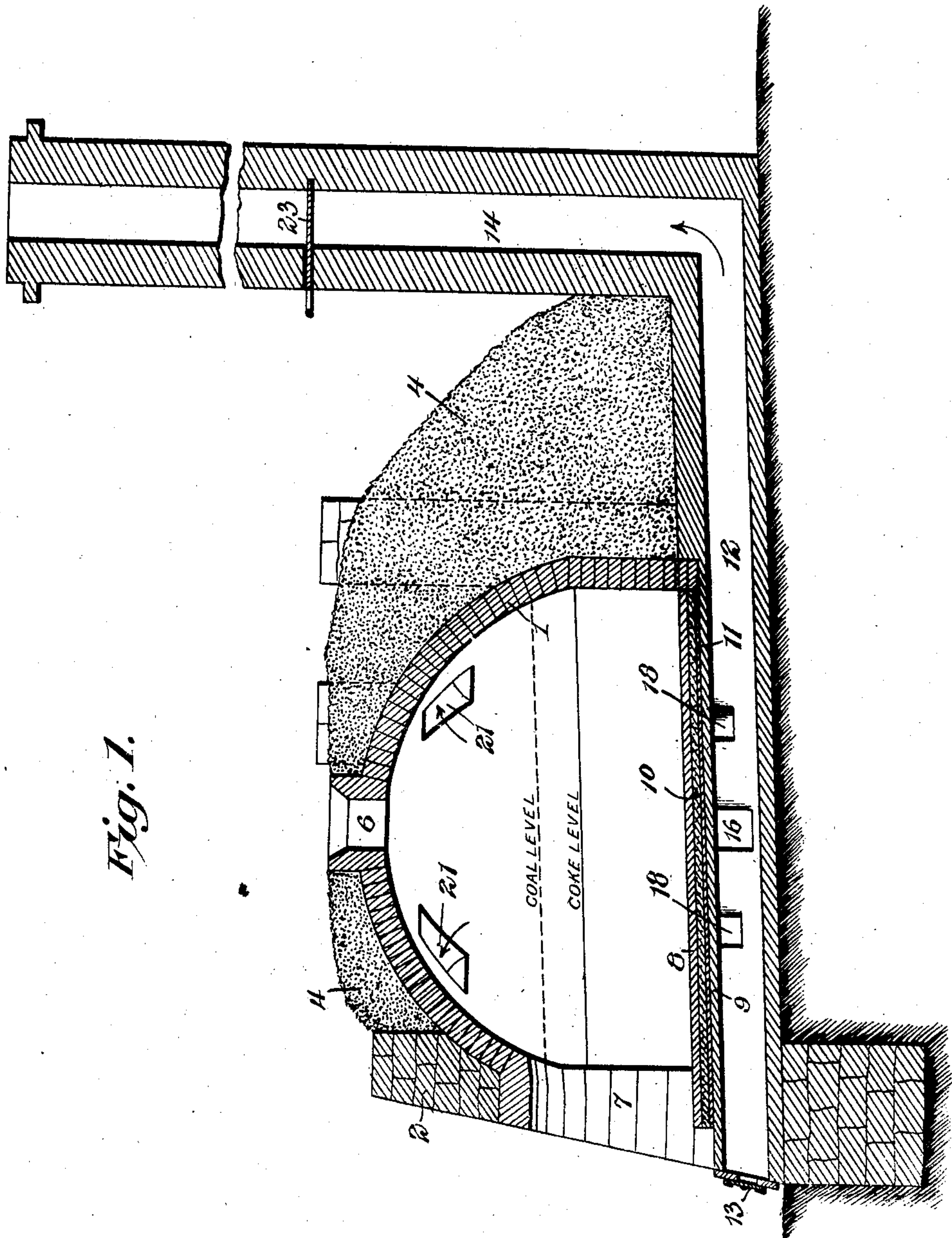


Fig. 1.

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By

E. J. Siggers

Attorney

Witnesses

Howard W. Orr.
H. J. Shepard.

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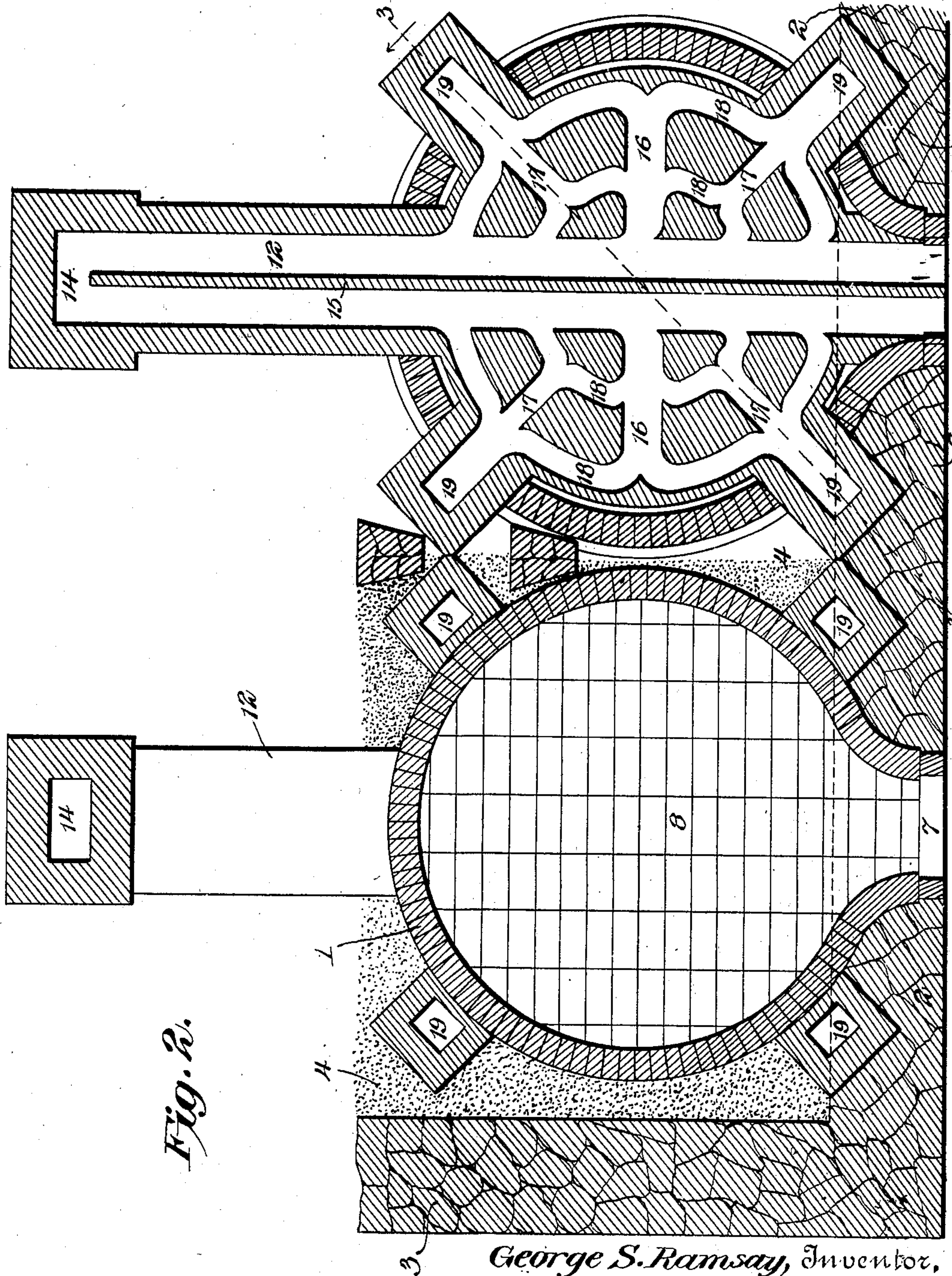


Fig. 2.

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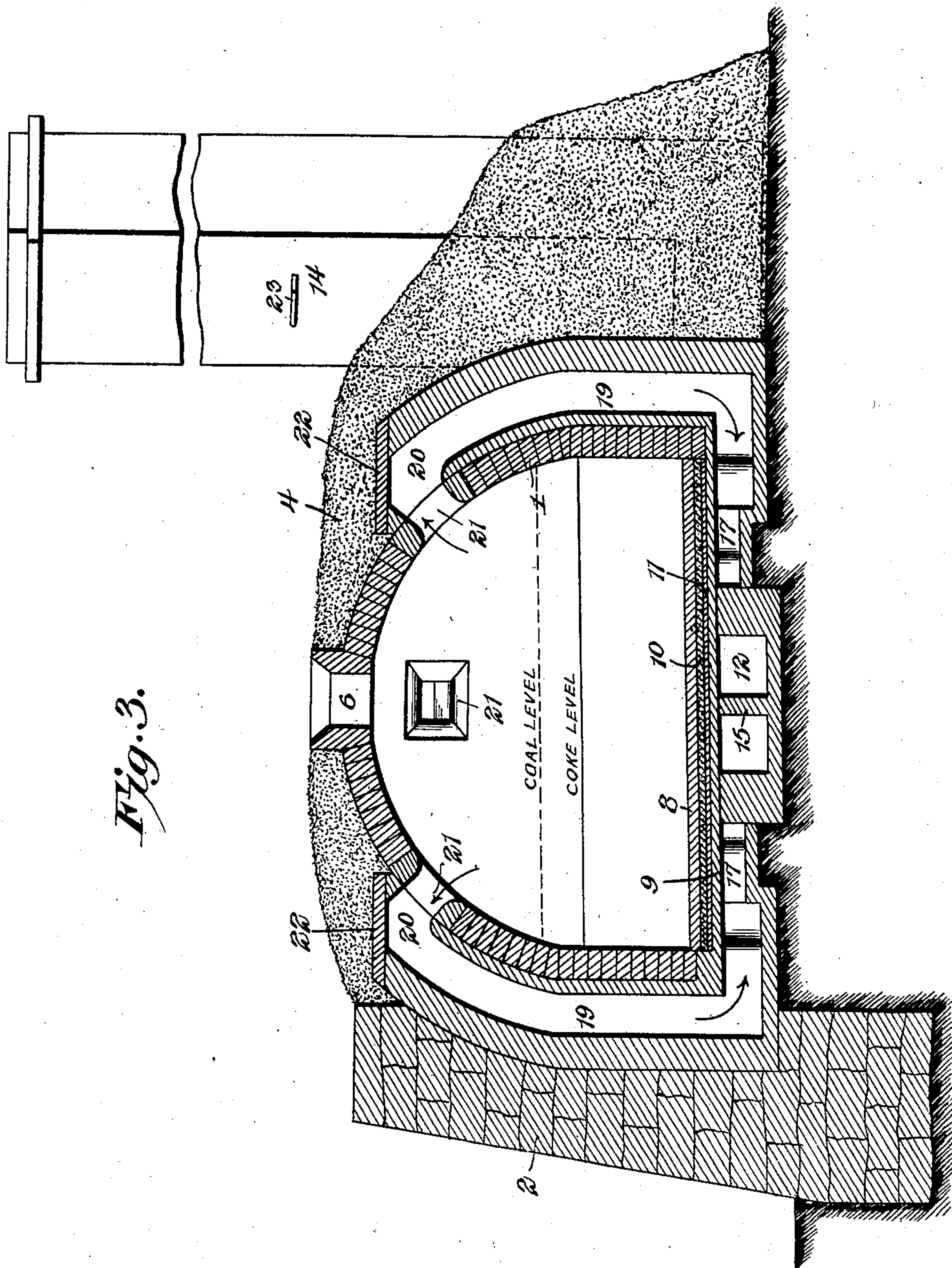
COKE OVEN.

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NO MODEL.

3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

GEORGE SHARPE RAMSAY, OF ST. MARYS, PENNSYLVANIA.

COKE-OVEN.

SPECIFICATION forming part of Letters Patent No. 733,872, dated July 14, 1903.

Application filed May 31, 1902. Serial No. 109,754. (No model.)

To all whom it may concern:

Be it known that I, GEORGE SHARPE RAMSAY, a citizen of the United States, residing at St. Marys, in the county of Elk and State of Pennsylvania, have invented a new and useful Coke-Oven, of which the following is a specification.

This invention relates to coke-ovens, and particularly to the beehive type of oven, and has for its object to provide for coking a maximum amount of coal in a minimum of time, to obviate the production of a black spongy coke at the bottom of the oven, and to produce a hard-bodied coke with a fully developed cellular structure which is substantially uniform throughout the entire mass of coke.

Prior to drawing coke from the oven it is cooled by being sprayed with water, whereby in the ordinary beehive form of oven the floor is also cooled, and when the oven is recharged, the temperature of the floor being low, the coal does not ignite uniformly throughout the mass for the reason that as the top of the charge is the hottest the coal burns downwardly from the top of the mass, thereby resulting in an uneven development of the cellular structure and producing a black spongy coke at the bottom of the oven. In view of this disadvantage it is a further object of the present invention to obviate cooling of the floor by the water employed in cooling the coke and to maintain a uniform temperature throughout the oven, so as to hasten the ignition of the coal, to dry up the water which collects upon the floor of the oven, and thereby to obviate the usual layer of damp black spongy coke at the bottom of the mass.

In carrying out the objects just mentioned it is designed to collect the gases and products of combustion within the interior of the oven and to carry the same back and forth beneath the floor, so as to maintain the latter in a heated condition. In this connection provision is made to prevent the gases and products of combustion from reëntering the oven and mixing with the material therein, as such remixing of the gases with the coal is detrimental to the best results of the oven. It is furthermore designed to give convenient access to the flues or passages for carrying the gases and products of combustion from

the interior of the oven to the space below the floor of the oven in order that such flues or passages may be conveniently cleansed, and it is also designed to give access to the flues or passages beneath the floor of the oven, so that said passages may be cleansed and also to admit external air beneath the floor for the purpose of supplying oxygen to the gases for promoting combustion thereof beneath the floor of the furnace.

With these and other objects in view the present invention consists in the combination and arrangement of parts, as will be hereinafter more fully described, shown in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that changes in the form, proportion, size, and minor details may be made within the scope of the claims without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings, Figure 1 is a vertical sectional view taken in the plane of the stack or chimney of a coke-oven constructed and arranged in accordance with the present invention. Fig. 2 is a plan section taken through a pair of adjacent ovens in different horizontal planes, one of these planes being across the top of the floor of one oven and the other being beneath the floor of the other oven to show the flues or passages beneath the floor. Fig. 3 is a vertical sectional view taken on the line 3 3 of Fig. 2.

Like characters of reference designate corresponding parts in all of the figures of the drawings.

For an adequate understanding of the present invention there has been shown in the accompanying drawings a coke-oven 1, which is preferably circular in shape, as shown in Fig. 2, and has a dome-shaped top, as in the ordinary beehive type of oven. While it is possible to use the ovens singly, it is preferred to arrange them side by side in close proximity and to wall up the fronts of the ovens with masonry 2, there being a wall of masonry 3 at each end of the series of ovens. The spaces intervening between the masonry and the ovens and also between adjacent ovens are filled with loam 4, so as to retain the heat within the ovens and to strengthen the entire structure. At the center of the dome of each

oven there is provided an opening 6, through which coal is introduced in charging the oven, and a doorway 7 is formed through the front wall of masonry for convenience in drawing the coke from the oven, this doorway being normally sealed when the oven is in operation.

The floor of the oven consists of upper and lower layers of tile 8 and 9, with a filling of sand 10 between the two layers of tile, there also being an asbestos lining 11 between the sand and the lower layer of tile. The asbestos is fibrous, and the sand, which is granular, is supported by the asbestos, which prevents the sand from sifting through the cracks of the layers of tile and producing openings. By this construction the gases are effectually prevented from reëntering the oven after they have passed out of the same. While I prefer asbestos, it will of course be understood that other fireproof material may be employed.

Beneath the floor of the oven and extending rearwardly is a diametric discharge-flue 12, the front end of which opens outwardly through the front wall of masonry directly below the oven-door and is provided with a damper-door 13 to give access to the flue and also to admit external air thereto. This main discharge-flue leads rearwardly from the oven and communicates with the lower end of a stack or chimney 14, so as to carry off the smoke and products of combustion. As best indicated in Fig. 2 of the drawings, it will be seen that the flue 12 is provided with a longitudinal upstanding partition 15, which extends from the front end of the flue and terminates short of the rear end thereof, thereby dividing the flue into opposite longitudinal sections, both of which communicate with the stack or chimney. It will be noted that the discharge-flue is disposed diametrically from front to rear of the oven, and the partition 15 is located centrally of the flue, so that the flue-sections lie in the opposite half portions of the space below the floor of the oven.

In addition to the main discharge-flue there are a plurality of radial flues located below the floor of the oven. Each half-section of the space below the oven-floor is provided with a central radial flue 16, which is disposed substantially at right angles to the main flue 12 and communicates at its inner end therewith, there being other radial flues 17, preferably two in number, which have their inner ends terminated short of the main flue. The central flue 16 is connected with the other radial flues by transverse passages or flues 18, which intersect the flues 17 and communicate with the main flue 12. The transverse flues are preferably disposed in arcs which are substantially concentric with respect to the vertical axis of the oven in order that there may be no angles to form abrupt shoulders, which might interfere with the free passage of the gases beneath the floor of the

oven. The bottom flues cause the bottom of the oven to be thoroughly subjected to the heating action of the gases without retarding the passage of the latter to the stack and without interfering with the draft, the gases being permitted to pass directly from the lower ends of the upright exterior flues to the stack at the back of the oven. It will here be noted that the lower layer of tile 9 forms the tops of the flues or passages beneath the floor of the oven, and the asbestos lining lies upon the top of this layer of tile, so as to effectually prevent the gases from rising through the floor and entering the interior of the oven, thereby to prevent deterioration of the coke by a remixing of the gases therewith. This is a very important feature of the present invention, as it is very detrimental to the best results of the oven to have the gases reënter the same and mingle with the coke, since it impairs the cellular structure thereof and materially decreases the hardness of the coke.

To set up a communication between the interior of the oven and the flues or passages beneath the floor thereof, there is provided a plurality of upstanding flues 19, preferably four in number, which are located in diametrically opposite pairs, with two flues at opposite sides of the main horizontal flue. Each of the upstanding flues is built upon the exterior of the oven and conforms to the curvature of the dome, the upper end portion of the flue being curved or bowed inwardly, as at 20, so as to communicate with an opening 21 in the dome, whereby the gases within the oven are adapted to be led outwardly through the several openings 21 and thence downwardly through the upstanding flues 19 and into communication with the flues beneath the floor of the oven at the points of intersection between the outer ends of the radial flues 17 and the outermost transverse flues 18. The upper end of each flue 19 is open at a point slightly above the opening 21 and is normally closed by means of a plate or tile 22, removably resting upon the top of the flue and held in place by the loam packed thereon, it being designed to remove the loam and the plate or tile whenever it is desired to have access to the interior of the flue for cleansing the same.

In operating the present form of oven it is charged with coal introduced through the opening 6 in the top of the dome to the level indicated by the dotted line in each of Figs. 1 and 3 of the drawings and designated "coal-level," after which the mass is ignited, and as the coal burns the gases and products of combustion pass outwardly through the openings 21, as indicated by the arrows in Figs. 1 and 3, thence downwardly through the flues 19, thence into the network of flues beneath the floor, and, finally, out through the main flue 12 to the chimney. By this arrangement of flues it will be apparent that the floor of the oven is maintained in a highly-heated condition, whereby the coking of the coal

commences at the bottom as well as at the top and a highly-intensified temperature is maintained throughout the entire interior of the oven and the primary stages of coking are materially accelerated.

In order that the best results may be attained, it has been determined by experiment that the openings 21, which communicate with the flues 19, should be located in a plane above the upper level of the coal and at a point above the floor about three-fourths of the distance from the floor to the top of the dome. It is preferred to take the gases from a comparatively low point rather than from the uppermost extremity of the oven, as the gases in the lower zone are in a better condition to unite with oxygen and produce combustion in the flues beneath the floor of the oven, and therefore the peculiar location of the gas-discharge openings in the dome of the oven is a very important feature of the present device. In connection with the heating of the floor of the oven it will be noted that the gases are conducted at each half-section of the space at two points which are substantially at opposite extremities of the space, and from these points the flues lead both directly and indirectly to the main flue, whereby the gases are quickly and evenly distributed and attack the floor of the oven substantially simultaneously throughout the entire area thereof and the gases are not held below the floor longer than they are capable of imparting heat thereto.

From the foregoing description it will be understood that it is designed to take the gases from the interior of the oven in a predetermined zone and to conduct these gases below the floor of the oven so as to heat the latter from beneath, and it is also designed to effectually prevent the gases from entering the oven and mixing with the coal and coke. Furthermore, by the provision of the damper-door 13 at the front end of the main discharge-flue 12 external air may be admitted to the flues beneath the floor, so as to supply the desired quantity of oxygen to promote combustion of the gases. This damper-door is also very useful to admit large quantities of cold external air into the flues beneath the floor of the oven in the final stages of the coking process to aid in cooling the coke prior to drawing the same through the door 7. The draft through the flues may be further controlled by means of a damper 23 in the chimney or stack.

By having the coking process begin at the bottom of the mass as well as at the top thereof the lower portion of the coal becomes coked before the upper portion becomes impervious to the volatile matter disassociated from the said lower portion, whereby the product of the oven has a very low percentage of sulfur, as the latter rises from the bottom of the oven and escapes through the openings 21 and flues 19. Moreover, as the coal burns with a higher temperature any deposits of

carbon-dust or soot are converted into coke and any carbon in the volatile gases will be deposited in the coke, thereby raising the percentage of fixed carbon and materially reducing the ashes and fine unmarketable coke. Another important advantage is that after one charge of coke has been withdrawn and the oven recharged the heated bottom of the oven dries up the water which is collected thereon from the cooling of the previous charge, so that when coking commences there is no occluded water in the coal to cause expansion of the coal, and thereby the production of a porous coke. As the oven is thoroughly dried before the coking commences, there is less waste in "discolored sides" and "black butts" where the coal rests against the sides and bottom of the oven.

What I claim is—

1. A coke-oven provided with bottom flues and having a floor provided with a gas-excluding packing composed of fibrous and granular material, the former being adapted to hold the latter, substantially as described.

2. A coke-oven having bottom flues and provided with a floor having a gas-excluding packing composed of fibrous material and sand supported by the fibrous material, whereby the sand is prevented from sifting through the floor, substantially as described.

3. A coke-oven having flues located below the floor thereof and in communication with the interior of the oven to receive gases and products of combustion, tiling covering the upper sides of the flues, a packing of asbestos upon the tiling, a layer of sand supported by the asbestos, and a layer of tiling upon the sand to form the floor of the oven, substantially as described.

4. A coke-oven having a stack, a main flue disposed centrally and transversely beneath the floor of the oven and in communication with the stack at one end and piercing the front wall of the oven and communicating with the outside air at the other end, other flues at opposite sides of the main flue and in communication therewith, and exterior upstanding flues having their upper ends piercing the wall of the oven with their lower ends in communication with the flues at the opposite sides of the main flue, said upstanding flues being located at opposite sides of the main flue and at the front and back of the oven, substantially as described.

5. A coke-oven having a stack, a main flue communicating with the stack at one end and with the outer air at the other end, a plurality of substantially radial flues beneath the floor communicating with the main flue, other flues connecting the radial flues, and one or more upstanding flues communicating with the interior of the oven and with the flues beneath the floor of the oven, substantially as described.

6. A coke-oven having a stack, a central transverse main flue disposed beneath the floor and communicating with the stack at

one end and with the outer air at the other end, substantially radial flues arranged beneath the floor and communicating with the main flue, transverse flues connecting the radial flues and also communicating with the main flue, and upstanding flues communicating with the interior of the oven and with the flues beneath the floor thereof, substantially as described.

7. A coke-oven having a stack, a main flue arranged beneath the floor and communicating with the stack at one end and with the outer air at the other, substantially radial flues, some of which communicate with the main flue and others terminating short thereof, transverse flues connecting the radial flues and also communicating with the main flue, and upstanding flues communicating at their lower ends with the points of intersection of some of the radial flues and the outermost transverse flues, the upper ends of the upstanding flues being in communication with the interior of the oven, substantially as described.

8. A coke-oven having a main central flue located beneath the floor thereof with its outer end piercing the front of the oven and provided with a door, a stack in communication with the rear end of the main flue, other flues beneath the floor at opposite sides of and in communication with the main flue, and flues communicating from the interior of the oven to the flues beneath the floor, substantially as described.

9. A coke-oven having a charging-opening at the top thereof, a door in the front of the oven for withdrawing the coke, a stack located in rear of the oven, a main flue located centrally below the floor of the oven with its front end piercing the front of the oven-wall and its rear end in communication with the stack, a damper-door for the front end of the flue, substantially radial flues at opposite sides of and in communication with the main flue and permitting the products of combustion to pass directly to the stack, other radial flues terminated short of the main flue, transverse flues connecting the radial flues and also in communication with the main flue, and independent upstanding flues upon the exterior of the oven-wall with their upper ends piercing the oven-wall for communication with the interior of the oven and their lower ends in communication with the flues beneath the floor at the points of intersection between the outermost transverse flues and those radial flues which terminate short of the main flue, the upstanding flues being located at opposite sides of the main flue and at the front and rear of the oven, substantially as described.

10. A coke-oven having flues beneath the floor thereof, an upright flue located exteriorly of the oven to reinforce the same, with its upper end in communication with the interior of the oven and its lower end communicating with the flues beneath the floor, and

a removable closure for the upper end portion of the flue which is exterior of and above the oven, substantially as described.

11. A coke-oven having a dome-shaped top, flues beneath the floor of the oven, one or more upright flues exteriorly of the oven to reinforce the same and conforming to the shape thereof, the upper end of each flue being bowed inwardly and piercing the dome of the oven, with the lower end of the flue in communication with the flues beneath the floor, and a removable plate closing the upper rounded portion of the flue which is exterior of the oven, substantially as described.

12. A coke-oven having a dome, flues beneath the floor thereof, independent upstanding exterior flues having their upper ends piercing the dome below the charging-opening and their lower ends in communication with the flues beneath the floor, said upstanding flues having their inner walls built against and following the curvature of the outside wall and dome of the oven, substantially as described.

13. A coke-oven having flues beneath the floor thereof, independent upstanding exterior flues having their upper ends piercing the oven-wall at the top below the charging-opening and their lower ends in communication with the flues beneath the floor, said upstanding flues having their inner walls fitted against and following the curvature of the outside wall of the oven, the top of the flues extending above the oven and covered by a removable closure, substantially as described.

14. A coke-oven having a stack, flues beneath the floor thereof, said flues being composed of a main flue, communicating with the stack and provided with a longitudinal partition, one end of the main flue being in communication with the outer air, and a series of radial and concentric flues on each side of the main flue and communicating therewith.

15. A coke-oven having a charging-opening at the top thereof, a door in the front of the oven for withdrawing the coke, a stack located in rear of the oven, a main flue located centrally below the floor of the oven with its front end piercing the front of the oven-wall and its rear end in communication with the stack, a damper-door for the front end of the flue, substantially radial flues communicating with the main flue, and independent upstanding flues upon the exterior of the oven-wall with their upper ends piercing the oven-wall for communication with the interior of the oven and their lower ends in communication with the flues beneath the floor, substantially as described.

16. A coke-oven having a dome-shaped top provided with a central charging-opening and a flue-opening piercing the dome and located below the charging-opening, flues beneath the floor, means to admit air to the flues, a stack in communication with the flues, an upright flue built upon the exterior of the oven to reinforce the same with its upper end reg-

istered with the flue-opening of the dome and its lower end projected beneath the floor and in communication with the flues, said upright flues being adapted to expand and contract
5 with the oven, and soil packed about the oven and the upright flue and also upon the top of the dome, substantially as described.

17. A coke-oven having a dome-shaped top provided with a central charging-opening and
10 a flue-opening piercing the dome below the charging-opening, flues beneath the floor of the oven, means to admit air to the flues, a main discharge-flue extending from beneath the floor to the exterior of the oven, a stack
15 in communication with the main flue, a door for drawing the coke, an upright flue built upon the exterior of the oven and conforming to the shape of the same with its upper end registered with the flue-opening in the
20 dome and its lower end extended beneath the floor and in communication with the flues, said upright flue being adapted to expand and contract with the oven, and soil packed about the oven and the flues and also upon
25 the top of the dome, substantially as described.

18. A coke-oven provided with a stack, a centrally-arranged main flue located beneath the floor of the oven and piercing the front
30 of the latter and communicating at its rear end with the stack and provided with a longitudinal partition extending from its front end to the stack, a door arranged at the front end of the main flue, other flues located be-
35 neath the floor and communicating with the main flue at opposite sides of the said partition, and upstanding flues communicating

with the interior of the oven and with the flues beneath the floor, substantially as described.

19. A coke-oven provided at its back with a stack, a centrally-arranged main flue piercing the front of the oven at a point beneath the floor thereof and extending rearward to the stack and provided with a longitudinal
45 partition, a door for the front of the main flue, upstanding flues communicating with the interior of the oven, and radial flues located beneath the floor of the oven and extending from the upstanding flues to the
50 main flue to permit the products of combustion to pass directly to the stack, substantially as described.

20. A coke-oven provided at its back with a stack, a centrally-arranged main flue lo-
55 cated beneath the floor of the oven and extending from the front of the latter to the stack and provided with a longitudinal partition, means for controlling the draft through the main flue, exteriorly-arranged upstand-
60 ing flues communicating with the interior of the oven, and bottom flues located beneath the floor and extending from the exterior flues to the main flue to permit the products
65 of combustion to pass directly from the upstanding flues to the stack, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

GEORGE SHARPE RAMSAY.

Witnesses:

C. J. RENWICK,
D. J. DRISCOLL.